1200 6th Avenue
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Seattle, WA 98101

Fact Sheet

The U.S. Environmental Protection Agency (EPA)
Proposes to Reissue a National Pollutant Discharge Elimination System (NPDES) Permit to Discharge Pollutants Pursuant to the Provisions of the Clean Water Act (CWA) to:

Kootenai-Ponderay Sewer District
Wastewater Treatment Plant

Public Comment Start Date:
Public Comment Expiration Date:

Technical Contact: Brian Nickel
206-553-6251
800-424-4372, ext. 6251 (within Alaska, Idaho, Oregon and Washington)
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The EPA Proposes To Reissue NPDES Permit
The EPA proposes to reissue the NPDES permit for the facility referenced above. The draft permit places conditions on the discharge of pollutants from the wastewater treatment plant to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility.

This Fact Sheet includes:
- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions for the facility
- a map and description of the discharge location
- technical material supporting the conditions in the permit

State Certification
The EPA is requesting that the Idaho Department of Environmental Quality (IDEQ) certify the NPDES permit for this facility, under Section 401 of the Clean Water Act. Comments regarding the certification should be directed to:

Idaho Department of Environmental Quality
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

Public Comment
Persons wishing to comment on, or request a Public Hearing for the draft permit for this facility may do so in writing by the expiration date of the Public Comment period. A request for a Public Hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. All comments and requests for Public Hearings must be in writing and should be submitted to the EPA as described in the Public Comments Section of the attached Public Notice.

After the Public Notice expires, and all comments have been considered, the EPA's regional Director for the Office of Water and Watersheds will make a final decision regarding permit issuance. If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If substantive comments are received, the EPA will address the comments and issue the permit. The permit will become effective no less than 30 days after the issuance date, unless an appeal is submitted to the Environmental Appeals Board within 30 days pursuant to 40 CFR 124.19.

Documents are Available for Review
The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting the EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday at the address below. The draft permits, fact sheet, and other information can also be found by visiting the Region 10 NPDES website at "http://epa.gov/r10earth/waterpermits.htm."

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, OWW-130
Seattle, Washington 98101
(206) 553-0523 or
Toll Free 1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permits are also available at:

Idaho Department of Environmental Quality
2110 Ironwood Parkway
Coeur d'Alene, ID 83814
(208) 769-1422

EPA Idaho Operations Office
1435 North Orchard Street
Boise, ID 83706
(208) 378-5746

Sandpoint Library
1407 Cedar Street
Sandpoint, ID 83864
(208) 263-6930

Acronyms

1Q10	1 day, 10 year low flow
7Q10	7 day, 10 year low flow
30B3	Biologically-based design flow intended to ensure an excursion frequency of less than once every three years, for a 30-day average flow.
30Q5	30 day, 5 year low flow
AML	Average Monthly Limit
AWL	Average Weekly Limit
BA	Biological Assessment
BE	Biological Evaluation
BO or BiOp	Biological Opinion
BOD_5	Biochemical oxygen demand, five-day
BMP	Best Management Practices
°C	Degrees Celsius
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CV	Coefficient of Variation
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
HUC	Hydrologic Unit Code
ICIS	Integrated Compliance Information System
IDEQ	Idaho Department of Environmental Quality
I/I	Infiltration and Inflow
LA	Load Allocation
lbs/day	Pounds per day
LTA	Long Term Average

mg/L	Milligrams per liter
ml	milliliters
ML	Minimum Level
µg/L	Micrograms per liter
mgd	Million gallons per day
MDL	Maximum Daily Limit or Method Detection Limit
N	Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OWW	Office of Water and Watersheds
O&M	Operations and maintenance
P	Phosphorus
POTW	Publicly owned treatment works
QAP	Quality assurance plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
RWC	Receiving Water Concentration
SS	Suspended Solids
SSO	Sanitary Sewer Overflow
s.u.	Standard Units
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TRC	Total Residual Chlorine
TSD	Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001)
TSS	Total suspended solids
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WLA	Wasteload allocation
WQBEL	Water quality-based effluent limit
WQS	Water Quality Standards
WWTP	Wastewater treatment plant

I. Applicant

A. General Information

This fact sheet provides information on the draft NPDES permit for the following entity:

Kootenai-Ponderay Sewer District (KPSD)
Wastewater Treatment Plant (WWTP)
NPDES Permit # ID0021229

Physical Address:
511 Whiskey Jack Road
Sandpoint, ID 83864

Mailing Address:
P.O. Box 562
Kootenai, ID 83840

Contact:
Tim Closson, Operations Manager

B. Permit History

The most recent NPDES permit for the KPSD WWTP was issued on November 30, 2001, became effective on January 5, 2002, and expired on January 5, 2007. An NPDES application for permit reissuance was submitted by the permittee on June 30, 2006. The EPA determined that the application was timely and complete. Therefore, pursuant to 40 CFR 122.6, the permit has been administratively extended and remains fully effective and enforceable.

II. Facility Information

A. Treatment Plant Description

The KPSD owns, operates, and maintains a WWTP located near Kootenai, Idaho. The secondary treatment plant discharges treated municipal wastewater to an unnamed tributary to Boyer Slough. The collection system has no combined sewers. The facility serves a resident population of 2,880. The design flow of the facility is 0.4 mgd.

The KPSD also holds a wastewater reuse permit issued by the Idaho Department of Environmental Quality (Permit # M-182-03). The reuse permit became effective on June 25, 2013 and expires on June 25, 2023. The KPSD's land application site and storage lagoon are located about 0.75 mile north of State Highway 200 and the City of Kootenai at 48° 19' 32" north latitude and 116° 30' 25" west longitude. The proposed NPDES permit is relevant only to the surface water discharge to the unnamed tributary to Boyer Slough.

Details about the wastewater treatment process and a map showing the location of the treatment facility and discharge are included in Appendix A.

B. Compliance History

From 2007 – 2012, the KPSD has generally been in compliance with the effluent limits in the 2002 permit, with the following exceptions shown in Table 1, below.

Table 1: Effluent Limit Violations August 2007 – August 2012

Parameter	Statistic	Units	Number of Instances
E. coli	Instantaneous maximum	#/100 ml	5
E. coli	Monthly geometric mean	#/100 ml	1
TSS	Monthly average	mg/L	1

III. Receiving Water

This facility discharges to an unnamed tributary to Boyer Slough near Sandpoint, Idaho. The outfall is located about 0.6 mile upstream (north) of Lake Pend Oreille.

A. Low Flow Conditions

The low flow conditions of a water body are used to assess the need for and develop water quality based effluent limits (see Appendix C of this fact sheet for additional information on flows).

The EPA used ambient flow data measured by the permittee, as a condition of the prior permit (see the 2002 permit at Page 5), to estimate the critical low flow conditions for the unnamed tributary to Boyer Slough, upstream from the point of discharge. The estimated 1Q10, 7Q10, 30Q5, and harmonic mean flows of the unnamed tributary to Boyer Slough, upstream from the point of discharge, are 0.12, 0.16, 0.17, and 0.34 CFS, respectively.

Based on the measured flow rates of Sand Creek and the drainage areas of Sand Creek and Boyer Slough, the estimated 30B3 flow rate of Boyer Slough (as opposed to the unnamed tributary that receives the discharge) is 0.76 CFS.

B. Water Quality Standards

Overview

Section 301(b)(1)(C) of the Clean Water Act (CWA) requires the development of limitations in permits necessary to meet water quality standards. Federal regulations at 40 CFR 122.4(d) require that the conditions in NPDES permits ensure compliance with the water quality standards of all affected States. A State's water quality standards are composed of use classifications, numeric and/or narrative water quality criteria and an anti-degradation policy.

The use classification system designates the beneficial uses that each water body is expected to achieve, such as drinking water supply, contact recreation, and aquatic life. The numeric and narrative water quality criteria are the criteria deemed necessary by the State to support the beneficial use classification of each water body. The anti-degradation policy represents a three-tiered approach to maintain and protect various levels of water quality and uses.

Designated Beneficial Uses

This facility discharges to an unnamed tributary of Boyer Slough in the Pend Oreille Lake Subbasin, HUC (17010214). Neither Boyer Slough nor its unnamed tributary have specific

use designations in the Idaho Water Quality Standards (IDAPA 58.01.02.110 through 160). The Water Quality Standards state that such "undesignated waterways" are to be protected for the uses of cold water aquatic life and primary contact recreation (IDAPA 58.01.02.101.01).

In addition, the Water Quality Standards state that all waters of the State of Idaho are protected for industrial and agricultural water supply, wildlife habitats and aesthetics (IDAPA 58.01.02.100.03.b and c, 100.04 and 100.05).

Lake Pend Oreille, about 0.6 mile downstream from the discharge, is designated for salmonid spawning and domestic water supply in addition to the above uses (IDAPA 58.01.02.110.05).

Surface Water Quality Criteria

The criteria are found in the following sections of the Idaho Water Quality Standards:

- The narrative criteria applicable to all surface waters of the State are found at IDAPA 58.01.02.200 (General Surface Water Quality Criteria).
- The numeric criteria for toxic substances for the protection of aquatic life and primary contact recreation are found at IDAPA 58.01.02.210 (Numeric Criteria for Toxic Substances for Waters Designated for Aquatic Life, Recreation, or Domestic Water Supply Use).
- Additional numeric criteria necessary for the protection of aquatic life can be found at IDAPA 58.01.02.250 (Surface Water Quality Criteria for Aquatic Life Use Designations).
- Numeric criteria necessary for the protection of recreation uses can be found at IDAPA 58.01.02.251 (Surface Water Quality Criteria for Recreation Use Designations).
- Water quality criteria for agricultural water supply can be found in the EPA's *Water Quality Criteria 1972*, also referred to as the "Blue Book" (EPA R3-73-033) (See IDAPA 58.01.02.252.02)

The numeric and narrative water quality criteria applicable to Boyer Slough and its unnamed tributary are provided in Appendix B of this fact sheet.

Antidegradation

The IDEQ has completed an antidegradation review which is included in the draft 401 certification for this permit. See Appendix F for the State's draft 401 water quality certification. The EPA has reviewed this antidegradation review and finds that it is consistent with the State's 401 certification requirements and the State's antidegradation implementation procedures. Comments on the 401 certification including the antidegradation review can be submitted to the IDEQ as set forth above (see State Certification).

C. Water Quality Limited Waters

Any waterbody for which the water quality does not, and/or is not expected to meet, applicable water quality standards is defined as a "water quality limited segment."

Section 303(d) of the Clean Water Act (CWA) requires states to develop a Total Maximum Daily Load (TMDL) management plan for water bodies determined to be water quality limited segments. A TMDL is a detailed analysis of the water body to determine its assimilative capacity. The assimilative capacity is the loading of a pollutant that a water body can assimilate without causing or contributing to a violation of water quality standards. Once the assimilative capacity of the water body has been determined, the TMDL will allocate that capacity among point and non-point pollutant sources, taking into account natural background levels and a margin of safety. Allocations for non-point sources are known as "load allocations" (LAs). The allocations for point sources, known as "waste load allocations" (WLAs), are implemented through effluent limitations in NPDES permits. Effluent limitations for point sources must be consistent with applicable TMDL allocations.

The State of Idaho's 2010 Integrated Report ("Integrated Report") Section 5 (i.e. the "303(d) list") lists the aquatic life uses of Boyer Slough as impaired due to unknown causes, based on a benthic macroinvertibrate bioassessment.

The Integrated Report also lists the aquatic life and recreation uses of Lake Pend Oreille, downstream from the discharge, as impaired due to concentrations of methylmercury in fish tissue that exceed Idaho's fish tissue criterion of 0.3 mg/kg.

No TMDLs have been completed by the State of Idaho to address these impairments, and none of the effluent limitations proposed in the draft permit are based on TMDL wasteload allocations.

IV. Effluent Limitations

A. Basis for Effluent Limitations

In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either technology-based limits or water quality-based limits. Technology-based limits are set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the water quality standards applicable to a waterbody are being met and may be more stringent than technology-based effluent limits. The basis for the effluent limits proposed in the draft permit is provided in Appendices D and E.

B. Proposed Effluent Limitations

The following summarizes the proposed effluent limits that are in the draft permit.

1. The permittee must not discharge floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses.
2. Removal Requirements for BOD_5 and TSS: The monthly average effluent concentration must not exceed 15 percent of the monthly average influent concentration. Percent removal of BOD_5 and TSS must be reported on the Discharge Monitoring Reports (DMRs). For each parameter, the monthly average percent removal must be calculated from the arithmetic mean of the influent values and the arithmetic mean of the effluent values for that month. Influent and effluent samples must be taken over approximately the same time period.

Table 2 below presents the proposed effluent limits for BOD_5, TSS, *E. coli*, chlorine, ammonia, nitrate + nitrite, and total phosphorus.

Table 2: Proposed Final Effluent Limits

Parameter	Units	Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit
Five-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	—
	lb/day	86	129	—
	% removal	85% (min.)	—	—
Total Suspended Solids (TSS)	mg/L	30	45	—
	lb/day	100	150	—
	% removal	85% (min.)	—	—
E. coli	#/100 ml	126 (geometric mean)	—	406 (instantaneous maximum)
Total Residual Chlorine	µg/L	9.6	—	19
	lb/day	0.032	—	0.063
Nitrate + Nitrite (as N)	mg/L	21.5	56.2	—
	lb/day	71.7	187	—
Total Ammonia (as N) (October – May)	mg/L	2.51	—	4.85
	lb/day	8.37	—	16.2
Total Ammonia (as N) (June – September)	mg/L	1.67	—	4.14
	lb/day	5.57	—	13.8
Total Phosphorus (as P) (June – September)	µg/L	9.0	18.0	—
	lb/day	0.030	0.060	—

C. Schedules of Compliance and Interim Limits

Schedules of compliance are authorized by federal NPDES regulations at 40 CFR 122.47 and by Section 400.03 of the Idaho Water Quality Standards. The Idaho water quality standards allow for compliance schedules "when new limitations are in the permit for the first time." The federal regulation allows schedules of compliance "when appropriate," and requires that such schedules require compliance as soon as possible. When the compliance schedule is longer than 1 year, federal regulations require that the schedule shall set forth interim requirements and the dates for their achievement. The time between the interim dates shall generally not exceed 1 year, and when the time necessary to complete any interim requirement is more than one year, the schedule shall require reports on progress toward completion of these interim requirements. Federal regulations also require that interim effluent limits be at least as stringent as the final limits in the previous permit (40 CFR 122.44(l)(1)).

EPA policy states that, in order to grant a compliance schedule, a permitting authority must make a reasonable finding that the permittee cannot comply with the effluent limit immediately upon the effective date of the final permit (see the *US EPA NPDES Permit Writers' Manual* at Section 9.1.3). The proposed effluent limits for ammonia, nitrate + nitrite, and total phosphorus are new limits that are in the permit for the first time.

The KPSD has the ability to dispose of 100% of its wastewater using storage and reuse during June, July, and August. Therefore, the KPSD can immediately comply with any new

effluent limit from June – August by ceasing its discharge. The KPSD may have to resume discharging to surface water as early as September 20th. Thus, the KPSD cannot comply with new effluent limits from September – May by ceasing its discharge.

The EPA has determined that the KPSD cannot comply with the new water quality-based effluent limits for ammonia and phosphorus immediately upon the effective date of the final permit. Therefore, the draft permit proposes a schedule of compliance for the new ammonia and phosphorus effluent limits. However, as explained above, no compliance schedule may be allowed from June – August, because the KPSD is capable of ceasing its discharge during this season.

The proposed interim limits for the month of September are expressed as monthly totals and are based on the loading of ammonia and phosphorus that the facility would discharge in the last 10 days of September, if the effluent flow rate were equal to the design flow rate of 0.4 mgd and the concentrations of phosphorus and ammonia were equal to the maximum concentrations reported on the district's DMRs from February 2002 through July 2013. The interim limits will encourage KPSD to fully utilize its storage and re use capacity in September, while still allowing KPSD to comply with the permit. Interim limits for September may be expressed as monthly totals instead of the average monthly and average weekly limits generally required for continuous discharges from POTWs (40 CFR 122.45(d)(1)), because the KPSD may not discharge continuously during September. Proposed September interim limits are 1,168 lb for ammonia and 282 lb for TP.

Other than storage and re-use, the KPSD facility does not have any treatment processes that remove significant amounts of phosphorus or ammonia. Therefore, no interim effluent limits are proposed except during the month of September.

The EPA has determined that the KPSD can comply with the new water quality-based effluent limits for nitrate + nitrite immediately upon the effective date of the final permit. Therefore no compliance schedule may be authorized for the new water quality-based effluent limits for nitrate + nitrite.

V. Monitoring Requirements

A. Basis for Effluent and Surface Water Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality.

The permittee is responsible for conducting the monitoring and for reporting results on DMRs or on the application for renewal, as appropriate, to the EPA.

B. Effluent Monitoring

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples must be used for averaging if they are conducted using the EPA-approved test methods (generally found in 40 CFR 136) or as specified in the permit.

The permit also requires the permittee to perform effluent monitoring required by part B.6 of the NPDES Form 2A application[1], so that these data will be available when the permittee applies for a renewal of its NPDES permit. The required monitoring frequency for those pollutants listed in part B.6 of the application form, which are not subject to effluent limits (total Kjeldahl nitrogen, total dissolved solids, and oil and grease), is twice per year. This monitoring frequency will ensure that there are at least 10 results for these pollutants at the end of the permit cycle. If there are less than 10 data points available, the uncertainty is too large to calculate an average or a standard deviation with sufficient confidence (see the TSD at Page 53).

Table 3, below, presents the proposed effluent monitoring requirements for the KPSD WWTP. The sampling location must be after the last treatment unit and prior to discharge to the receiving water. The samples must be representative of the volume and nature of the monitored discharge. If no discharge occurs during the reporting period, "no discharge" shall be reported on the DMR.

Table 3: Effluent Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type
Flow	mgd	Effluent	Continuous	recording
Temperature	°C	Effluent	1/week	grab
BOD_5	mg/L	Influent & Effluent	2/month	24-hour composite
	lb/day			calculation[1]
	% Removal	% Removal	1/month	calculation[2]
TSS	mg/L	Influent & Effluent	2/month	24-hour composite
	lb/day			calculation[1]
	% Removal	% Removal	1/month	calculation[2]
pH	standard units	Effluent	5/week	grab
E. Coli	#/100 ml	Effluent	5/month	grab
Total Residual Chlorine	µg/L	Effluent	5/week	grab
	lb/day	Effluent		calculation[1]
Total Ammonia as N (October – August until ? years after the effective date of the final permit)	mg/L	Effluent	1/month	24-hour composite
Total Ammonia as N (September)	mg/L	Effluent	1/week	24-hour composite
	lb/day	Effluent		calculation[1]
Total Ammonia as N (Year-Round beginning ? years after the effective date of the final permit)	mg/L	Effluent	1/week	24-hour composite
	lb/day	Effluent		calculation[1]
Nitrate + Nitrite as N	mg/L	Effluent	1/week	24-hour composite
	lb/day	Effluent		calculation[1]
Total Phosphorus as P (October – May)	mg/L	Effluent	1/month	24-hour composite
Total Phosphorus as P (June – August)	mg/L	Effluent	1/week	24-hour composite
	lb/day	Effluent		calculation[1]

[1] See also Appendix J to 40 CFR 122.

Table 3: Effluent Monitoring Requirements				
Parameter	**Units**	**Sample Location**	**Sample Frequency**	**Sample Type**
Total Phosphorus as P (September until ? years after the effective date of the final permit)	mg/L	Effluent	1/week	24-hour composite
	lb/month	Effluent		calculation[1]
Total Phosphorus as P (September beginning ? years after the effective date of the final permit)	mg/L	Effluent	1/week	24-hour composite
	lb/day	Effluent		calculation[1]
Dissolved Oxygen	mg/L	Effluent	1/month	grab
Total Kjeldahl Nitrogen	mg/L	Effluent	2/year	24-hour composite
Oil and Grease	mg/L	Effluent	2/year	24-hour composite
Total Dissolved Solids	mg/L	Effluent	2/year	24-hour composite
Total Mercury	µg/L	Effluent	2/year	24-hour composite

Notes:
1. Loading is calculated by multiplying the concentration in mg/L by the flow in mgd and a conversion factor of 8.34. If the concentration is measured in µg/L, the conversion factor is 0.00834.
2. Percent removal is calculated using the following equation:
(average monthly influent – average monthly effluent) ÷ average monthly influent.

Monitoring Changes from the Previous Permit

Monitoring frequencies for certain parameters have been reduced, relative to the previous permit. The reductions in monitoring frequency are based on the EPA's *Interim Guidance for Performance-based Reduction of NPDES Permit Monitoring Frequencies* (April 19, 1996). Table 4, below, summarizes the reductions in monitoring frequency that were made based on the guidance.

Table 4: Reductions in Monitoring Frequency			
Parameter	**Ratio of Long Term Average Discharge to Avg. Monthly Limit**	**2002 Permit Monitoring Frequency**	**Reduced Monitoring Frequency**
BOD_5	39%	1/week	2/month
TSS	35%	1/week	2/month

Monitoring frequencies for ammonia, nitrate + nitrite, and total phosphorus have been increased relative to the 2002 permit, in order to determine compliance with the new water quality-based effluent limits for those parameters. For ammonia and total phosphorus, the monitoring frequencies have not been increased relative to the prior permit unless and until there is an effluent limit (either final or interim) in effect.

The prior permit did not require monitoring for dissolved oxygen. Monthly effluent monitoring of dissolved oxygen is proposed in the draft permit to determine if the discharge has the reasonable potential to cause or contribute to nonattainment of Idaho's water quality criteria for dissolved oxygen. In addition, effluent data for dissolved oxygen are required in order to prepare a complete application.

Effluent monitoring for total mercury is proposed in order to determine if the discharge has the reasonable potential to cause or contribute to the excursions above Idaho's methylmercury fish tissue criterion of 0.3 mg/kg that have been measured in Lake Pend Oreille, downstream from the discharge.

C. Surface Water Monitoring

Table 5 presents the proposed surface water monitoring requirements for the draft permit. Surface water monitoring results must be submitted with the DMRs.

The primary purpose of the proposed surface water monitoring is to determine if additional or more-stringent effluent limits are necessary for nutrients (i.e., total phosphorus and/or total nitrogen), dissolved oxygen, biochemical oxygen demand, or temperature. Surface water monitoring must occur during the final full calendar year of the permit term.

Table 5: Receiving Water Monitoring Requirements

Parameter and Units	Locations	Frequency	Sample Type
Flow (Unnamed arm of Boyer Slough, CFS)	Upstream	1/month	Measure
Flow (Boyer Slough, CFS)	Downstream	1/month	Measure
Dissolved Oxygen (mg/L)	Upstream	1/month	Grab
Dissolved Oxygen (mg/L)	Downstream	Continuous	Recording
Dissolved Oxygen (% saturation)	Downstream	Continuous	Recording
Temperature (°C)	Upstream & Downstream	Continuous	Recording
BOD_5 (mg/L)	Upstream & Downstream	1/month	Grab
Total Phosphorus (µg/L)	Downstream	1/week	Grab
Total Nitrogen (µg/L)	Downstream	1/week	Grab
Water column chlorophyll a (µg/L)	Downstream	1/week	Grab
Periphyton chlorophyll a (mg/m^2)	Downstream	1/month	Measure
Secchi depth (m)	Downstream	1/month	Measure

VI. Sludge (Biosolids) Requirements

The EPA Region 10 separates wastewater and sludge permitting. The EPA has authority under the CWA to issue separate sludge-only permits for the purposes of regulating biosolids. The EPA may issue a sludge-only permit to each facility at a later date, as appropriate.

Until future issuance of a sludge-only permit, sludge management and disposal activities at each facility continue to be subject to the national sewage sludge standards at 40 CFR Part 503 and any requirements of the State's biosolids program. The Part 503 regulations are self-implementing, which means that facilities must comply with them whether or not a permit has been issued.

VII. Other Permit Conditions

A. Quality Assurance Plan

The federal regulation at 40 CFR 122.41(e) requires the permittee to develop procedures to ensure that the monitoring data submitted is accurate and to explain data anomalies if they occur. The KPSD is required to update the Quality Assurance Plan for the KPSD WWTP within 90 days of the effective date of the final permit. The Quality Assurance Plan must include standard operating procedures the permittee will follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting. The plan must be retained on site and be made available to the EPA and the IDEQ upon request.

B. Operation and Maintenance Plan

The permit requires the KPSD to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limits, monitoring requirements, and all other permit requirements at all times. The permittee is required to develop and implement an operation and maintenance plan for their facility within 180 days of the effective date of the final permit. The plan must be retained on site and made available to the EPA and the IDEQ upon request.

C. Sanitary Sewer Overflows and Proper Operation and Maintenance of the Collection System

Untreated or partially treated discharges from separate sanitary sewer systems are referred to as sanitary sewer overflows (SSOs). SSOs may present serious risks of human exposure when released to certain areas, such as streets, private property, basements, and receiving waters used for drinking water, fishing and shellfishing, or contact recreation. Untreated sewage contains pathogens and other pollutants, which are toxic. SSOs are not authorized under this permit. Pursuant to the NPDES regulations, discharges from separate sanitary sewer systems authorized by NPDES permits must meet effluent limitations that are based upon secondary treatment. Further, discharges must meet any more stringent effluent limitations that are established to meet the EPA-approved state water quality standards.

The permit contains language to address SSO reporting and public notice and operation and maintenance of the collection system. The permit requires that the permittee identify SSO occurrences and their causes. In addition, the permit establishes reporting, record keeping and third party notification of SSOs. Finally, the permit requires proper operation and maintenance of the collection system. The following specific permit conditions apply:

Immediate Reporting – The permittee is required to notify the EPA of an SSO within 24 hours of the time the permittee becomes aware of the overflow. (See 40 CFR 122.41(l)(6))

Written Reports – The permittee is required to provide the EPA a written report within five days of the time it became aware of any overflow that is subject to the immediate reporting provision. (See 40 CFR 122.41(l)(6)(i)).

Third Party Notice – The permit requires that the permittee establish a process to notify specified third parties of SSOs that may endanger health due to a likelihood of human exposure; or unanticipated bypass and upset that exceeds any effluent limitation in the permit or that may endanger health due to a likelihood of human exposure. The permittee is required to develop, in consultation with appropriate authorities at the local, county, tribal and/or state level, a plan that describes how, under various overflow (and unanticipated bypass and upset) scenarios, the public, as well as other entities, would be notified of overflows that may endanger health. The plan should identify all overflows that would be reported and to whom, and the specific information that would be reported. The plan should include a description of lines of communication and the identities of responsible officials. (See 40 CFR 122.41(l)(6)).

Record Keeping – The permittee is required to keep records of SSOs. The permittee must retain the reports submitted to the EPA and other appropriate reports that could include work orders associated with investigation of system problems related to a SSO, that describes the

steps taken or planned to reduce, eliminate, and prevent reoccurrence of the SSO. (See 40 CFR 122.41(j)).

Proper Operation and Maintenance – The permit requires proper operation and maintenance of the collection system. (See 40 CFR 122.41(d) and (e)). SSOs may be indicative of improper operation and maintenance of the collection system. The permittee may consider the development and implementation of a capacity, management, operation and maintenance (CMOM) program.

The permittee may refer to the Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems (EPA 305-B-05-002). This guide identifies some of the criteria used by the EPA inspectors to evaluate a collection system's management, operation and maintenance program activities. Owners/operators can review their own systems against the checklist (Chapter 3) to reduce the occurrence of sewer overflows and improve or maintain compliance.

D. Electronic Submission of Discharge Monitoring Reports

The draft permit includes provisions to allow the permittee the option to submit DMR data electronically using NetDMR. NetDMR is a national web-based tool that allows DMR data to be submitted electronically via a secure Internet application. NetDMR allows participants to discontinue mailing in paper forms under 40 CFR § 122.41 and § 403.12. The permittee may use NetDMR after requesting and receiving permission from the EPA Region 10.

Under NetDMR, all reports required under the permit are submitted to the EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it is no longer required to submit paper copies of DMRs or other reports to the EPA and IDEQ.

The EPA encourages permittees to sign up for NetDMR, and currently conducts free training on the use of NetDMR. Further information about NetDMR, including upcoming trainings and contacts, is provided on the following website: http://www.epa.gov/netdmr.

E. Standard Permit Provisions

Sections III, IV and V of the draft permit contain standard regulatory language that must be included in all NPDES permits. Because these requirements are based directly on NPDES regulations, they cannot be challenged in the context of an NPDES permit action. The standard regulatory language covers requirements such as monitoring, recording, and reporting requirements, compliance responsibilities, and other general requirements.

VIII. Other Legal Requirements

A. Endangered Species Act

To be added.

B. Essential Fish Habitat

Essential fish habitat (EFH) is the waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires the EPA to consult with NOAA Fisheries when

a proposed discharge has the potential to adversely affect EFH (i.e., reduce quality and/or quantity of EFH).

The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

The EPA has determined that issuance of this permit will not adversely affect EFH in the vicinity of the discharge. Neither Boyer Slough, Lake Pend Oreille, nor the Pend Oreille River are designated as EFH. The EPA has provided NOAA Fisheries with copies of the draft permit and fact sheet during the public notice period. Any comments received from NOAA Fisheries regarding EFH will be considered prior to reissuance of this permit.

C. State Certification

Section 401 of the CWA requires the EPA to seek State certification before issuing a final permit. As a result of the certification, the State may require more stringent permit conditions or additional monitoring requirements to ensure that the permit complies with water quality standards, or treatment standards established pursuant to any State law or regulation.

D. Permit Expiration

The permit will expire five years from the effective date.

IX. References

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control.* US Environmental Protection Agency, Office of Water, EPA/505/2-90-001.

Water Pollution Control Federation. Subcommittee on Chlorination of Wastewater. *Chlorination of Wastewater.* Water Pollution Control Federation. Washington, D.C. 1976.

EPA. 2010. *NPDES Permit Writers' Manual.* Environmental Protection Agency, Office of Wastewater Management, EPA-833-K-10-001.

Appendix A: Facility Information

General Information

NPDES ID Number:	ID0021229
Physical Address:	511 Whiskey Jack Road Sandpoint, Idaho 83864
Mailing Address:	P.O. Box 562 Kootenai, Idaho 83840
Facility Background:	The most recent NPDES permit for the KPSD WWTP was issued on November 30, 2001, became effective on January 5, 2002, and expired on January 5, 2007. An NPDES application for permit reissuance was submitted by the permittee on June 30, 2006. The EPA determined that the application was timely and complete. Therefore, pursuant to 40 CFR 122.6, the permit has been administratively extended and remains fully effective and enforceable.

Facility Information

Type of Facility:	Publicly Owned Treatment Works (POTW)
Treatment Train:	Bar rack, primary, secondary and polishing/storage lagoons, chlorination, dechlorination.
Flow:	Design flow is 0.4 mgd. The maximum monthly average flow measured between February 2002 and August 2012 was 0.81 mgd.
Outfall Location:	latitude 48° 18’ 44.2” longitude 116° 29’ 45.8”

Receiving Water Information

Receiving Water:	Unnamed Tributary to Boyer Slough
Watershed:	Pend Oreille Lake (HUC 17010214)
Beneficial Uses:	Cold water aquatic life; primary contact recreation; agricultural and industrial water supply; wildlife habitats; and aesthetics (domestic water supply downstream in Lake Pend Oreille).

Appendix B: Water Quality Criteria Summary

This appendix provides a summary of water quality criteria applicable to Boyer Slough and its unnamed tributary that receives the discharge.

Idaho water quality standards include criteria necessary to protect designated beneficial uses. The standards are divided into three sections: General Water Quality Criteria, Surface Water Quality Criteria for Use Classifications, and Site-Specific Surface Water Quality Criteria. The EPA has determined that the criteria listed below are applicable to Boyer Slough and its unnamed tributary. This determination was based on (1) the applicable beneficial uses (i.e., cold water aquatic life, primary contact recreation, agricultural water supply, industrial water supply, wildlife habitats, and aesthetics), (2) the type of facility, (3) a review of the application materials submitted by the permittee, and (4) the quality of the water in Boyer Slough and its unnamed tributary.

A. General Criteria (IDAPA 58.01.02.200)

Surface waters of the state shall be free from:

- hazardous materials,
- toxic substances in concentrations that impair designated beneficial uses,
- deleterious materials,
- radioactive materials,
- floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses,
- excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses,
- oxygen demanding materials in concentrations that would result in an anaerobic water condition

B. Numeric Criteria for Toxics (IDAPA 58.01.02.210)

This section of the Idaho Water Quality Standards provides the numeric criteria for toxic substances for waters designated for aquatic life, recreation, or domestic water supply use. Monitoring of the effluent has shown that the following toxic pollutants have been present at quantifiable levels in the effluent.

- Ammonia
- Chlorine (Total Residual)
- Nitrate + Nitrite[1]

C. Surface Water Criteria To Protect Aquatic Life Uses (IDAPA 58.01.02.250)

- pH: Within the range of 6.5 to 9.0

[1] The State of Idaho does not have numeric water quality criteria for nitrate + nitrite, however, this pollutant has been measured in the discharge and has the reasonable potential to cause or contribute to excursions above Idaho's narrative water quality criteria for toxic pollutants in Lake Pend Oreille, downstream of the discharge.

- Total Dissolved Gas: <110% saturation at atm. pressure.
- Dissolved Oxygen: Exceed 6 mg/L at all times.
- Temperature: Water temperatures of 22°C or less with a maximum daily average of no greater than 19°C.
- Turbidity: Turbidity below any applicable mixing zone set by the Department shall not exceed background turbidity by more than 50 NTU instantaneously or more than 25 NTU for more than ten (10) consecutive days.

Ammonia

Ammonia criteria are based on a formula which relies on the pH and temperature of the receiving water, because the fraction of ammonia present as the toxic, un-ionized form increases with increasing pH and temperature. Therefore, the criteria become more stringent as pH and temperature increase. The table below details the equations used to determine water quality criteria for ammonia.

The KPSD collected pH and temperature data in Boyer Slough upstream and downstream of the facility from March 2002 – February 2003. These data were used to determine the appropriate pH and temperature values to calculate the ammonia criteria.

As with any natural water body, the pH and temperature of the water will vary over time. Therefore, to protect water quality criteria it is important to develop the criteria based on pH and temperature values that will be protective of aquatic life at all times.

The EPA used the maximum downstream pH of 8.1 standard units for the ammonia criteria calculations. No seasonal variation was assumed for pH. The maximum temperature for June – September is 18 °C and the maximum temperature for October – May is 9 °C. The values of the ammonia criteria calculated from these values are shown in Table B-1, below.

Table B-1: Water Quality Criteria for Ammonia

	Acute Criterion[1]	Chronic Criterion[2]
Equations:	$\frac{0.275}{1+10^{7.204-\text{pH}}}+\frac{39}{1+10^{\text{pH}-7.204}}$	$\left(\frac{0.0577}{1+10^{7.688-\text{pH}}}+\frac{2.487}{1+10^{\text{pH}-7.688}}\right)\times \text{MIN}\left(2.85,1.45\times 10^{0.028\times(25-\text{T})}\right)$
Oct. – May	4.63	2.10
June – Sep.	4.63	1.68

D. Surface Water Quality Criteria For Recreational Use Designations (IDAPA 58.01.02.251)

- Geometric Mean Criterion. Waters designated for primary or secondary contact recreation are not to contain *E. coli* in concentrations exceeding a geometric mean of 126 *E. coli* organisms per 100 ml based on a minimum of 5 samples taken every 3 to 7 days over a 30 day period.
- Use of Single Sample Values: A water sample exceeding the *E. coli* single sample maximums below indicates likely exceedance of the geometric mean criterion but is not alone a violation of water quality standards. If a single sample exceeds the maximums set forth…
- For waters designated as primary contact recreation, a single sample maximum of 406 *E. coli* organisms per100 ml. at any time.

Appendix C: Low Flow Conditions and Dilution

A. Low Flow Conditions

The low flow conditions of a water body are used to determine water quality-based effluent limits. In general, Idaho's water quality standards require criteria be evaluated at the following low flow receiving water conditions (See IDAPA 58.01.02.210.03) as defined below:

Table C-1: Critical Low Flow Rates	
Acute aquatic life	1Q10 or 1B3
Chronic aquatic life	7Q10 or 4B3
Non-carcinogenic human health criteria	30Q5
Carcinogenic human health criteria	harmonic mean flow
Ammonia	30B3, 30Q10 or 30Q5

1. The 1Q10 represents the lowest one day flow with an average recurrence frequency of once in 10 years.
2. The 1B3 is biologically based and indicates an allowable exceedence of once every 3 years.
3. The 7Q10 represents lowest average 7 consecutive day flow with an average recurrence frequency of once in 10 years.
4. The 4B3 is biologically based and indicates an allowable exceedance for 4 consecutive days once every 3 years.
5. The 30Q5 represents the lowest average 30 consecutive day flow with an average recurrence frequency of once in 5 years.
7. The harmonic mean is a long-term mean flow value calculated by dividing the number of daily flow measurements by the sum of the reciprocals of the flows.

Idaho's water quality standards do not specify a low flow to use for acute and chronic ammonia criteria, however, the EPA's *Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia; Notice* (64 FR 71976, December 22, 1999) identifies the appropriate flows to be used. For the 30-day average chronic aquatic life criterion for ammonia in fresh water, the 30B3 biologically-based low flow rate is recommended, but the 30Q5 or 30Q10 hydrologically-based flow rates are at least as protective as the 30B3 and may be used instead of the 30B3 (see 64 FR 71976). The EPA has used the 30Q5 flow rate in this case.

The EPA estimated the critical low flows upstream from the point of discharge from flow data measured by the KPSD, as a condition of the 2002 permit (see the 2002 permit at Page 5). The estimated low flows for the station are presented in Table C-2 below.

Table C-2: Critical Flows of Unnamed Tributary to Boyer Slough Upstream from the KPSD Discharge	
Flows	**CFS**
1Q10	0.12
7Q10	0.16
30Q5	0.17
Harmonic Mean	0.34

Because the criteria for total phosphorus and nitrate + nitrite apply at the boundary between Lake Pend Oreille and Boyer Slough, the EPA also estimated the 30B3 flow rate of Boyer Slough (as opposed to its unnamed tributary that receives the discharge) by first calculating the 30B3 flow rate of Sand Creek, then scaling the 30B3 of Sand Creek by the ratio of the drainage areas of Sand Creek and Boyer Slough. Normally, the EPA would use the 30Q5 flow rate to determine dilution for nitrate + nitrite and total phosphorus. There are not enough data available to

calculate the 30Q5 flow rate of Sand Creek; however, there are enough data to calculate the 30B3. The 30B3 and 30Q5 flow rates are considered equally protective (64 FR 71976). The 30B3 flow rate of Sand Creek is 3.48 CFS.[1] The drainage area of Boyer Slough, estimated using the USGS StreamStats tool, is 8.04 square miles. The drainage area of the Sand Creek gauging station (USGS station #12392660) is 36.6 square miles. Therefore, the 30B3 flow rate of Boyer Slough is estimated as follows:

$$3.48 \text{ CFS} \times (8.04 \text{ mi}^2 \div 36.6 \text{ mi}^2) = 0.76 \text{ CFS}$$

B. Mixing Zones and Dilution

In some cases a dilution allowance or mixing zone is permitted. A mixing zone is an area where an effluent discharge undergoes initial dilution and is extended to cover the secondary mixing in the ambient water body. It is an allocated impact zone where the water quality standards may be exceeded as long as acutely toxic conditions are prevented (EPA 1994). The federal regulations at 40 CFR 131.13 states that "States may, at their discretion, include in their State standards, policies generally affecting their application and implementation, such as mixing zones, low flows and variances."

The Idaho Water Quality Standards at IDAPA 58.01.02.060 provides Idaho's mixing zone policy for point source discharges. The policy allows the IDEQ to authorize a mixing zone for a point source discharge after a biological, chemical, and physical appraisal of the receiving water and the proposed discharge.

The following formula is used to calculate a dilution factor based on the allowed mixing.

$$D = \frac{Q_e + Q_u \times \%MZ}{Q_e}$$

Where:

D	=	Dilution Factor
Q_e	=	Effluent flow rate (set equal to the design flow of the WWTP)
Q_u	=	Receiving water low flow rate upstream of the discharge (1Q10, 7Q10, 30B3, etc)
%MZ	=	Percent Mixing Zone

The IDEQ proposes to authorize 25% mixing zone for ammonia and chlorine. The EPA calculated dilution factors for year round critical low flow conditions. All dilution factors are calculated with the effluent flow rate set equal to the design flow of 0.4 mgd. The dilution factors are listed in Table C-2.

Lake Pend Oreille, downstream from the discharge is designated for domestic water supply uses. Because the domestic water supply use does not apply at the point of discharge, but does apply downstream of the discharge, where Boyer Slough flows into Lake Pend Oreille, 100% of Boyer Slough's estimated 30B3 flow rate was used to determine dilution for nitrate + nitrite.

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[1] There were also enough data to calculate the 30Q4 (30-day, 4-year) low flow rate of Sand Creek. The 30Q4 flow rate is 3.67 CFS. Other factors being equal, the 30Q5 flow rate of a given stream will be less than the 30Q4 flow rate. Thus, the fact that the 30B3 flow rate (3.48 CFS) is less than the 30Q4 flow rate (3.67 CFS) shows that the 30B3 flow rate is a reasonable substitute for the 30Q5 flow rate in this case.

Table C-3: Dilution Factors		
Flows	**Associated Criteria**	**Dilution Factor**
1Q10	Acute aquatic life	1.05
7Q10	Chronic aquatic life (except ammonia)	1.06
30Q5 (unnamed tributary to Boyer Slough, 25% mixing zone)	Chronic ammonia	1.07
30B3 (Boyer Slough, 100% mixing zone)	Nitrate + nitrite	2.23

C. References

EPA. 1994. *Water Quality Standards Handbook: Second Edition*. Environmental Protection Agency. Office of Water. EPA 823-B-94-005a. August 1994.

Appendix D: Basis for Effluent Limits

The following discussion explains the derivation of technology and water quality based effluent limits proposed in the draft permit. Part A discusses technology-based effluent limits, Part B discusses water quality-based effluent limits in general, Part C discusses anti-backsliding provisions, Part D discusses the effluent limits imposed due to the State's anti-degradation policy, and Part E presents a summary of the facility specific limits.

A. Technology-Based Effluent Limits

Federal Secondary Treatment Effluent Limits

The CWA requires POTWs to meet performance-based requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," which all POTWs were required to meet by July 1, 1977. The EPA has developed and promulgated "secondary treatment" effluent limitations, which are found in 40 CFR 133.102. These technology-based effluent limits apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. The federally promulgated secondary treatment effluent limits are listed in Table D-1.

Table D-1: Secondary Treatment Effluent Limits (40 CFR 133.102)

Parameter	Average Monthly Limit	Average Weekly Limit	Range
BOD_5	30 mg/L	45 mg/L	—
TSS	30 mg/L	45 mg/L	—
Removal Rates for BOD_5 and TSS	85% (minimum)	—	—
pH	—	—	6.0 - 9.0 s.u.

Mass-Based Limits

The federal regulation at 40 CFR 122.45(f) requires that effluent limits be expressed in terms of mass, if possible. The regulation at 40 CFR 122.45(b) requires that effluent limitations for POTWs be calculated based on the design flow of the facility. The mass based limits are expressed in pounds per day and are calculated as follows:

Mass based limit (lb/day) = concentration limit (mg/L) × design flow (mgd) × 8.34[1]

Since the design flow for this facility is 0.4 mgd, the technology based mass limits for BOD_5 and TSS are calculated as follows:

Average Monthly Limit = 30 mg/L × 0.4 mgd × 8.34 = 100 lbs/day

Average Weekly Limit = 45 mg/L × 0.4 mgd × 8.34 = 150 lbs/day

The TSS effluent limits proposed in the draft permit are the technology-based effluent limits described above. The concentration and removal rate effluent limits for BOD_5 are the

[1] 8.34 is a conversion factor equal to the density of water in pounds per gallon.

technology-based effluent limits described above. However, as explained below, the mass loading (lb/day) limits for BOD_5 are more stringent than the technology-based limits.

Section 402(o) of the Clean Water Act and federal regulations at 40 CFR §122.44(l) generally prohibit the renewal, reissuance or modification of an existing NPDES permit that contains effluent limits, permit conditions or standards that are less stringent than those established in the previous permit (i.e., anti-backsliding) but provide limited exceptions.

The 2002 permit continued forward the BOD_5 loading limits that were in the 1984 permit. It does not appear from the 1983 fact sheet and the 1981 State of Idaho staff evaluation that the BOD_5 effluent loading limits in the 1984 permit were based on state standards.

According to section 7.2.2 of the EPA permit writers' manual, the anti-backsliding regulations at 40 CFR 122.44(l) are applicable to effluent limits other than those based on state standards. This regulation states that effluent limits in a reissued permit must be at least as stringent as the final effluent limitations in the previous permit unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued and would constitute cause for permit modification or revocation and reissuance under 40 CFR 122.62. Furthermore, any revised effluent limits would need to ensure compliance with water quality standards for dissolved oxygen (40 CFR 122.4(d), 122.44(d)(1), CWA Section 301(b)(1)(C)).

The circumstances on which the previous permit was based have not materially or substantially changed since the time the permit was issued. Furthermore, there are no dissolved oxygen (DO) data available for the effluent or the receiving water, and no BOD data for the receiving water. Therefore, there are insufficient data to determine if the BOD_5 effluent loading (lb/day) limits could be revised to be consistent with the technology-based limits described above, while still ensuring compliance with water quality standards. Therefore, the BOD_5 loading (lb/day) limits from the 1984 and 2002 permits have been retained in the draft permit. These are an average monthly limit of 86 lb/day and an average weekly limit of 129 lb/day. The permittee has generally been in compliance with these effluent limits since 2002, except for one violation of the average weekly limit in May 2004.

The draft permit proposes effluent and receiving water monitoring requirements for DO, BOD_5, and temperature. These data will be used to determine if revisions to the BOD_5 effluent limits are appropriate when the permit is reissued.

Chlorine

Chlorine is often used to disinfect municipal wastewater prior to discharge. The KPSD WWTP uses chlorine disinfection.

A 0.5 mg/L average monthly limit for chlorine is derived from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after 15 minutes of contact time. Therefore, a wastewater treatment plant that provides adequate chlorine contact time can meet a 0.5 mg/L total residual chlorine limit on a monthly average basis. In addition to average monthly limits (AMLs), NPDES regulations require effluent limits for POTWs to be expressed as average weekly limits (AWLs) unless impracticable. For technology-based effluent limits, the AWL is calculated to be

1.5 times the AML, consistent with the "secondary treatment" limits for BOD_5 and TSS. This results in an AWL for chlorine of 0.75 mg/L.

Since the federal regulations at 40 CFR 122.45 (b) and (f) require limitations for POTWs to be expressed as mass based limits using the design flow of the facility, mass based limits for chlorine are calculated as follows:

Monthly average Limit= 0.5 mg/L x 0.4 mgd x 8.34 = 1.67 lbs/day

Weekly average Limit = 0.75 mg/L x 0.4 mgd x 8.34 = 2.50 lbs/day

The EPA has determined that the above technology-based effluent limits would not ensure compliance with water quality standards for chlorine. Therefore, more-stringent water quality based effluent limits are proposed for chlorine.

B. Water Quality-based Effluent Limits

Statutory and Regulatory Basis

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards. Discharges to State or Tribal waters must also comply with limitations imposed by the State or Tribe as part of its certification of NPDES permits under section 401 of the CWA. Federal regulations at 40 CFR 122.4(d) prohibit the issuance of an NPDES permit that does not ensure compliance with the water quality standards of all affected States.

The NPDES regulation (40 CFR 122.44(d)(1)) implementing Section 301(b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State or Tribal water quality standard, including narrative criteria for water quality, and that the level of water quality to be achieved by limits on point sources is derived from and complies with all applicable water quality standards.

The regulations require the permitting authority to make this evaluation using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

Reasonable Potential Analysis

When evaluating the effluent to determine if the pollutant parameters in the effluent are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State/Tribal water quality criterion, the EPA projects the receiving water concentration (downstream of where the effluent enters the receiving water) for each pollutant of concern. The EPA uses the concentration of the pollutant in the effluent and receiving water and, if appropriate, the dilution available from the receiving water, to project the receiving water concentration. If the projected concentration of the pollutant in the receiving water exceeds the numeric criterion for that specific pollutant, then the discharge has the reasonable potential to cause or contribute to an excursion above the applicable water quality standard, and a water quality-based effluent limit is required.

Sometimes it may be appropriate to allow a small area of the receiving water to provide dilution of the effluent. These areas are called mixing zones. Mixing zone allowances will increase the mass loadings of the pollutant to the water body and will decrease treatment requirements. Mixing zones can be used only when there is adequate receiving water flow volume and the concentration of the pollutant in the receiving water is less than the criterion necessary to protect the designated uses of the water body.

Mixing zones must be authorized by the State. The IDEQ's draft certification proposes to authorize a mixing zone of 25 percent of the receiving water flow volume for the following parameters:

- Total residual chlorine
- Total ammonia as N

In addition, because the criteria for nitrate + nitrite apply at the boundary between Lake Pend Oreille and Boyer Slough, 100% of the flow of Boyer Slough is used to calculate dilution for nitrate + nitrite.

If IDEQ does not grant the mixing zones in its final certification of this permit, the water quality-based effluent limits will be re-calculated such that the criteria are met before the effluent is discharged to the receiving water.

Procedure for Deriving Water Quality-based Effluent Limits

The first step in developing a water quality-based effluent limit is to develop a wasteload allocation (WLA) for the pollutant. A wasteload allocation is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of water quality standards in the receiving water. Wasteload allocations are determined in one of the following ways:

1. TMDL-Based Wasteload Allocation

   Where the receiving water quality does not meet water quality standards, the wasteload allocation is generally based on a TMDL developed by the State. A TMDL is a determination of the amount of a pollutant from point, non-point, and natural background sources that may be discharged to a water body without causing the water body to exceed the criterion for that pollutant. Any loading above this capacity risks violating water quality standards.

   There are no TMDLs that include wasteload allocations for the KPSD WWTP. Thus, no effluent limits in the draft permit are calculated from TMDL-based wasteload allocations. However, there is an approved TMDL for nutrients in the nearshore waters of Lake Pend Oreille, downstream from the discharge.

2. Mixing zone based WLA

   When the State authorizes a mixing zone for the discharge, the WLA is calculated by using a simple mass balance equation. The equation takes into account the available dilution provided by the mixing zone, and the background concentrations of the pollutant. The WLAs for ammonia, chlorine, and nitrate + nitrite were derived using a mixing zone.

3. Criterion as the Wasteload Allocation

In some cases a mixing zone cannot be authorized, either because the receiving water is already at, or exceeds, the criterion, the receiving water flow is too low to provide dilution, or the facility can achieve the effluent limit without a mixing zone. In such cases, the criterion becomes the wasteload allocation. Establishing the criterion as the wasteload allocation ensures that the effluent discharge will not contribute to an exceedance of the criteria. The WLAs for E. coli, pH and phosphorus were derived using this method.

Once the wasteload allocation has been developed, the EPA applies the statistical permit limit derivation approach described in Chapter 5 of the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001, March 1991, hereafter referred to as the TSD) to obtain monthly average, and weekly average or daily maximum permit limits. This approach takes into account effluent variability, sampling frequency, and water quality standards.

Summary - Water Quality-based Effluent Limits

The water quality based effluent limits in the draft permit are summarized below.

Phosphorus

As explained below, EPA has determined that the TP in the discharge has the reasonable potential to cause or contribute to excursions above Idaho's narrative water quality criterion for nutrients from June – September.

Limiting Nutrient

Both nitrogen and phosphorus can contribute to violations of WQS that result from excess nutrients (i.e., nuisance algae or aesthetics, DO, and pH). Liebig's Law of the Minimum states that the nutrient that is less abundant relative to the biological requirements of algae is the limiting nutrient (i.e., the nutrient that controls primary productivity) (EPA 1972). Phosphorus is generally the limiting nutrient in freshwaters. This is because blue-green algae can "fix" elemental nitrogen from the air as a nutrient source or utilize nitrogen in the water column at very low concentrations and thereby grow in a low-nitrogen environment (EPA 1999), and because freshwater lakes, reservoirs, rivers, and streams are generally supported by large watershed areas, which capture, accumulate, and mobilize large amounts of nitrogen relative to phosphorus (Paerl 2009).

Several studies have concluded that phosphorus is the nutrient most likely limiting algae growth in Lake Pend Orielle, downstream from the discharge (Tetra Tech 2002).

To determine the limiting nutrient in Boyer Slough, the EPA considered the nitrogen-to-phosphorus (N:P) mass ratio. If the ratio is less than 7.2:1, total nitrogen is the most likely limiting nutrient; otherwise, total phosphorus is the most likely limiting nutrient (EPA 1999). The estimated N:P mass ratios, based on receiving water data submitted by the permittee, were 78:1 upstream of the discharge and 8.5:1 downstream of the discharge. Therefore, TP is the most likely limiting nutrient in both Boyer Slough and Lake Pend Oreille.

Interpretation of the Narrative Criterion for Nutrients

The State of Idaho has a narrative water quality criterion for nutrients which reads, "surface waters of the state shall be free from excess nutrients that can cause visible slime growths or

other nuisance aquatic growths impairing designated beneficial uses." Where a State or Tribe has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State or Tribal water quality standard, the permitting authority must establish effluent limits using one or more of the options provided in 40 CFR 122.44(d)(1)(vi).

EPA is establishing water quality-based effluent limits for TP based on 40 CFR 122.44(d)(1)(vi)(A), which allows the permitting authority to establish effluent limits using a calculated numeric water quality criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use.

The EPA has determined that the average TP concentration target of 9 µg/L from the Total Maximum Daily Load for Nutrients for the Nearshore Waters of Pend Oreille Lake, Idaho ("Nearshore TMDL") is the appropriate value to interpret Idaho's narrative criterion for nutrients for the purposes of determining reasonable potential and, if necessary, for calculating effluent limits for TP. This interpretation of the narrative nutrient criterion is valid from June – September, which is the period of time during which the Nearshore TMDL establishes concentration targets and load allocations for TP.

The 9 µg/L average target is from an Idaho document: the Nearshore TMDL. The EPA believes this concentration is reasonable because it is less than EPA's effects based criteria from *Quality Criteria for Water 1986*, which are 50 µg/L for streams flowing into lakes or impoundments and 25 µg/L within the lake or reservoir. It is also very close to the EPA's more recent recommendation of 8.8 µg/L for lakes and reservoirs in aggregate nutrient ecoregion II (EPA 2000). Therefore, the EPA believes 9 µg/L of TP will be protective of both Boyer Slough and Lake Pend Oreille.

The 9 µg/L target from the Nearshore TMDL applies from June – September. The Nearshore TMDL does not establish nutrient targets or allocations for the October – May time frame.

The EPA has required year-round monitoring of the effluent for total phosphorus and total nitrogen, and receiving water monitoring for total phosphorus, total nitrogen, dissolved oxygen, pH, as well as chlorophyll a in both the water column and in periphyton. These data will allow the EPA to determine if effluent limits for nutrients are necessary at any time during October – May, when this permit is reissued.

Ambient Concentration

The KPSD sampled the receiving water for TP upstream and downstream from the discharge. Upstream from the discharge, all but one of the 12 results were less than the practical quantification limit (PQL) of 50 µg/L. The single result that was greater than the 50 µg/L PQL was 60 µg/L. The EPA has used maximum likelihood estimation to estimate the average upstream concentration based on the available data. The estimated average upstream TP concentration is 33 µg/L. This is higher than the 9 µg/L interpretation of Idaho's narrative criterion for nutrients. Therefore, the receiving water cannot provide dilution of KPSD's discharge of TP. The 9 µg/L interpretation of Idaho's narrative nutrient criterion must be applied at the end-of-pipe, without allowing for dilution (i.e., a mixing zone).

Downstream from the discharge, all but one of the 12 samples for TP were greater than the PQL. The average TP concentration measured downstream from the discharge was 1,730 µg/L, and the maximum TP concentration was 2,800 µg/L.

Reasonable Potential

Federal regulations require that effluent limitations in NPDES permits "must control all pollutants or pollutant parameters…which…are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality (40 CFR 122.44(d)(1)(i))."

Reasonable potential analyses may account for the dilution of the effluent in the receiving water, where appropriate (40 CFR 122.44(d)(1)(ii)). However, as explained above, the concentration of phosphorus upstream from the discharge is higher than the interpreted narrative criterion. Therefore, the receiving water cannot provide dilution of the phosphorus in the effluent and dilution may not be considered in the reasonable potential analysis.

The prior permit required effluent monitoring for TP once per month. The average effluent concentration of TP measured between February 2002 and August 2012 is 5,045 µg/L, and the maximum concentration is 8,460 µg/L. Because dilution may not be considered in this reasonable potential analysis and the discharge concentration is greater than the interpreted narrative criterion, the discharge has the reasonable potential to cause or contribute to excursions above water quality standards for nutrients. Therefore, EPA must establish effluent limits for total phosphorus in the permit (40 CFR 122.44(d)(1)(i – iii)).

Furthermore, the maximum measured concentration of TP in the unnamed tributary to Boyer Slough, downstream from the discharge is 2,800 µg/L, even though the maximum measured upstream concentration is 60 µg/L. Thus, the ambient water quality data demonstrates that the WWTP contributes to high phosphorus concentrations in the receiving water.

Wasteload Allocation

According to Section 6.2.1.2 of the 2010 *U.S. EPA Permit Writers' Manual* and Section 5.4 of the TSD, wasteload allocations need not be established by a total maximum daily load (TMDL), but may instead be calculated for an individual point source as part of the permitting process. The wasteload allocation is the amount of phosphorus that the permittee may discharge, while ensuring a level of water quality that is derived from and complies with all applicable water quality standards (40 CFR 122.44(d)(1)(vii)(A)).

Because dilution may not be considered in this case due to concentrations of TP upstream from the discharge that exceed the interpreted narrative criterion, the WLA is equal to the interpreted narrative criterion.

$$C_e = WLA = C_d = 9\ \mu g/L$$

Translating the Wasteload Allocation to Effluent Limits

NPDES regulations at 40 CFR 122.45(f) require effluent limits in NPDES permits to be expressed in terms of mass, and states that "pollutants limited in terms of mass additionally may be limited in terms of other units of measurement, and the permit shall require the permittee to comply with both limitations." Section 5.7.1 of the TSD states that the EPA "recommends that permit limits on both mass and concentration be specified for effluents discharging into waters

with less than 100 fold dilution." Because there is less than 100-fold dilution in this case, the permit proposes both mass and concentration limits for TP.

NPDES regulations at 40 CFR 122.45(d)(2) require that effluent limitations for continuous discharges from POTWs be expressed as average monthly and average weekly limits unless impracticable.

In this case, the interpretation of the narrative criterion, and, in turn, the wasteload allocation, is a seasonal average concentration. However, the season lasts only four months. The EPA has set the average monthly limit equal to the 9 µg/L TP WLA. This is somewhat conservative, because it is possible that the average discharge over a four-month period could be 9 µg/L or less, even if the average discharge within a particular month is greater than 9 µg/L.

Consistent with 40 CFR 122.45(d)(2), EPA has also established an average weekly discharge limitation for TP, in addition to the average monthly discharge limitation. To calculate the average weekly limit, the EPA used Table 5-3 of the *Technical Support Document for Water Quality-based Toxics Control*. This table provides ratios between the average monthly and the maximum daily limit, however, when the required sampling frequency is once per week or less frequent, there is no practical difference between an average weekly limit and a maximum daily limit. The draft permit proposes a sampling frequency of once per week for TP. Attainment of the proposed average monthly effluent limits for TP will require upgrades to the POTW. Therefore, the historic effluent variability for TP may not be representative of future effluent variability. Therefore, the EPA has assumed that the CV is equal to 0.6, consistent with the recommendation of the TSD when effluent data are not available (see TSD at Page E-3). The EPA has used the 95th percentile probability basis for the average monthly limit and the 99th percentile probability basis for the average weekly limit. This results in a ratio between the average monthly and average weekly limit of 2.01:1. Therefore, the average weekly limit is 18 µg/L (9 µg/L × 2.01 = 18 µg/L).

Nitrate + Nitrite

The Idaho WQS do not include numeric criteria for nitrate + nitrite. However, the State of Idaho does have a narrative water quality criterion for toxic substances, which reads "surface waters of the state shall be free from toxic substances in concentrations that impair designated beneficial uses" (IDAPA 58.01.02.200.2). Where a State or Tribe has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State or Tribal water quality standard, the permitting authority must establish effluent limits using one or more of the options provided in 40 CFR 122.44(d)(1)(vi). The EPA is establishing water quality-based effluent limits for nitrate + nitrite based on 40 CFR 122.44(d)(1)(vi)(B), which allows the permitting authority to establish effluent limits using EPA's water quality criteria, published under Section 304(a) of the CWA.

The EPA-recommended water quality criterion for nitrate + nitrite for the consumption of water and organisms is 10 mg/L (EPA 1986). EPA has used this recommended criterion to interpret the State of Idaho's narrative water quality criterion for toxic substances. This interpretation of the narrative toxics criterion does not apply at the point of discharge, because Boyer Slough and the unnamed tributary that receives the discharge is not designated for domestic water supply. However, Lake Pend Oreille, downstream from the discharge, is designated for domestic water supply.

The EPA has determined that the discharge has the reasonable potential to cause or contribute to excursions above the 10 mg/L criterion, at the mouth of Boyer Slough. Therefore, the permit contains a water quality-based effluent limit for nitrate + nitrite.

Consistent with the recommendations of section 5.4.4 of the TSD for establishing effluent limits based on human health criteria, the average monthly limit has been set equal to the wasteload allocation of 21.5 mg/L.

NPDES regulations require that effluent limitations for POTWs that discharge continuously be expressed as average monthly and average weekly discharge limitations, unless impracticable (40 CFR 122.45(d)(2)). Therefore, in addition to the average monthly limit, the permit proposes an average weekly limit for nitrate + nitrite. To calculate the average weekly limit, EPA used the equation printed Table 5-3 of the TSD. This table provides ratios between the average monthly and the maximum daily limit, however, when the required sampling frequency is once per week or less frequent, there is no practical difference between an average weekly limit and a maximum daily limit. The draft permit proposes a sampling frequency of once per week for nitrate + nitrite. The CV for the effluent nitrate + nitrite concentration is 1.09. The EPA has used the 95th percentile probability basis for the average monthly limit and the 99th percentile probability basis for the average weekly limit. This results in a ratio between the average monthly and average weekly limit of 2.61:1. Therefore, the average weekly limit is 21.5 mg/L × 2.61 = 56.2 mg/L.

Ammonia

As shown in Appendix E, a reasonable potential calculation showed that the KPSD WWTP discharge would have the reasonable potential to cause or contribute to a violation of the water quality criteria for ammonia. In addition, ammonia concentrations as high as 19 mg/L have been measured in the unnamed tributary to Boyer Slough, downstream from the discharge. This concentration exceeds Idaho's water quality criteria for ammonia. Therefore, the draft permit contains a water quality-based effluent limit for ammonia.

See Appendix E for reasonable potential and effluent limit calculations for ammonia.

pH

The Idaho water quality standards at IDAPA 58.01.02.250.01.a, require pH values of the receiving water to be within the range of 6.5 to 9.0.

The facility was required to monitor the effluent pH as a condition of the prior permit. From September 2007 – August 2012, the minimum effluent pH measured was 6.7 standard units and the maximum pH measured was 8.38 standard units. The effluent data indicate that the facility can comply with Idaho's water quality criteria for pH at point of discharge. Therefore, no mixing zone is proposed for pH, and the pH effluent limits require a range of 6.5 – 9.0 standard units at all times.

E. coli

The Idaho water quality standards state that waters of the State of Idaho, that are designated for recreation, are not to contain *E. coli* bacteria in concentrations exceeding 126 organisms per 100 ml based on a minimum of five samples taken every three to seven days over a thirty day

period. Therefore, the draft permit contains a monthly geometric mean effluent limit for *E. coli* of 126 organisms per 100 ml (IDAPA 58.01.02.251.01.a.).

The Idaho water quality standards also state that a water sample that exceeds certain "single sample maximum" values indicates a likely exceedance of the geometric mean criterion, although it is not, in and of itself, a violation of water quality standards. For waters designated for primary contact recreation, the "single sample maximum" value is 406 organisms per 100 ml (IDAPA 58.01.02.251.01.b.ii.).

The goal of a water quality-based effluent limit is to ensure a low probability that water quality standards will be exceeded in the receiving water as a result of a discharge, while considering the variability of the pollutant in the effluent. Because a single sample value exceeding 406 organisms per 100 ml indicates a likely exceedance of the geometric mean criterion, the EPA has imposed an instantaneous (single grab sample) maximum effluent limit for *E. coli* of 406 organisms per 100 ml, in addition to a monthly geometric mean limit of 126 organisms per 100 ml, which directly implements the water quality criterion for *E. coli*. This will ensure that the discharge will have a low probability of exceeding water quality standards for *E. coli*.

Regulations at 40 CFR 122.45(d)(2) require that effluent limitations for continuous discharges from POTWs be expressed as average monthly and average weekly limits, unless impracticable. Additionally, the terms "average monthly limit" and "average weekly limit" are defined in 40 CFR 122.2 as being arithmetic (as opposed to geometric) averages. It is impracticable to properly implement a 30-day geometric mean criterion in a permit using monthly and weekly arithmetic average limits. The geometric mean of a given data set is equal to the arithmetic mean of that data set if and only if all of the values in that data set are equal. Otherwise, the geometric mean is always less than the arithmetic mean. In order to ensure that the effluent limits are "derived from and comply with" the geometric mean water quality criterion, as required by 40 CFR 122.44(d)(1)(vii)(A), it is necessary to express the effluent limits as a monthly geometric mean and an instantaneous maximum limit.

Chlorine

The prior permit included water quality-based effluent limits for chlorine.

When the EPA recalculated water quality-based effluent limits for chlorine based on the water quality criteria and the dilution available in the unnamed tributary, the EPA determined that the average monthly chlorine effluent limits in the prior permit are not stringent enough to ensure compliance with water quality criteria for chlorine. Therefore, the EPA has calculated more-stringent water quality-based average monthly effluent limits for chlorine. The maximum daily limits for chlorine are adequately stringent to ensure compliance with water quality criteria and have been continued forward in the draft permit.

Residues

The Idaho water quality standards require that surface waters of the State be free from floating, suspended or submerged matter of any kind in concentrations impairing designated beneficial uses. The draft permit contains a narrative limitation prohibiting the discharge of such materials.

Dissolved Oxygen and BOD_5

There are no dissolved oxygen (DO) data available for the effluent or the receiving water, and no BOD data for the receiving water. Therefore there are insufficient data to determine if water

quality-based effluent limits are necessary for DO and/or BOD_5. The draft permit proposes effluent and receiving water monitoring requirements for DO, BOD_5, and temperature to determine if such effluent limits are necessary.

C. Antidegradation

The proposed issuance of an NPDES permit triggers the need to ensure that the conditions in the permit ensure that Tier I, II, and III of the State's antidegradation policy are met. An anti-degradation analysis was conducted by the IDEQ. See Appendix F for the antidegradation analysis.

D. References

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Appendix E: Reasonable Potential and Water Quality-Based Effluent Limit Calculations

Part A of this appendix explains the process the EPA has used to determine if the discharge authorized in the draft permit has the reasonable potential to cause or contribute to a violation of Idaho's federally approved water quality standards. Part B demonstrates how the water quality-based effluent limits (WQBELs) in the draft permit were calculated.

A. Reasonable Potential Analysis

The EPA uses the process described in the *Technical Support Document for Water Quality-based Toxics Control* (EPA 1991) to determine reasonable potential. To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the EPA compares the maximum projected receiving water concentration to the water quality criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is reasonable potential, and a water quality-based effluent limit must be included in the permit. This following section discusses how the maximum projected receiving water concentration is determined.

Mass Balance

For discharges to flowing water bodies, the maximum projected receiving water concentration is determined using the following mass balance equation:

$$C_d Q_d = C_e Q_e + C_u Q_u \qquad \text{Equation 1}$$

where,

C_d = Receiving water concentration downstream of the effluent discharge (that is, the concentration at the edge of the mixing zone)
C_e = Maximum projected effluent concentration
C_u = 95th percentile measured receiving water upstream concentration
Q_d = Receiving water flow rate downstream of the effluent discharge = Q_e+Q_u
Q_e = Effluent flow rate (set equal to the design flow of the WWTP)
Q_u = Receiving water low flow rate upstream of the discharge (1Q10, 7Q10 or 30B3)

When the mass balance equation is solved for C_d, it becomes:

$$C_d = \frac{C_e \times Q_e + C_u \times Q_u}{Q_e + Q_u} \qquad \text{Equation 2}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with 100% of the receiving stream.

If the mixing zone is based on less than complete mixing with the receiving water, the equation becomes:

$$C_d = \frac{C_e \times Q_e + C_u \times (Q_u \times \%MZ)}{Q_e + (Q_u \times \%MZ)} \qquad \text{Equation 3}$$

Where:

% MZ = the percentage of the receiving water flow available for mixing.

If a mixing zone is not allowed, dilution is not considered when projecting the receiving water concentration and,

$$C_d = C_e \qquad \text{Equation 4}$$

A dilution factor (D) can be introduced to describe the allowable mixing. Where the dilution factor is expressed as:

$$D = \frac{Q_e + Q_u \times \%MZ}{Q_e} \qquad \text{Equation 5}$$

After the dilution factor simplification, the mass balance equation becomes:

$$C_d = \frac{C_e - C_u}{D} + C_u \qquad \text{Equation 6}$$

The above equations for C_d are the forms of the mass balance equation which were used to determine reasonable potential and calculate wasteload allocations.

Maximum Projected Effluent Concentration

When determining the projected receiving water concentration downstream of the effluent discharge, the EPA's *Technical Support Document for Water Quality-based Toxics Control* (EPA 1991) recommends using the maximum projected effluent concentration (C_e) in the mass balance calculation (see equation 3, page C-5). To determine the maximum projected effluent concentration (C_e) the EPA has developed a statistical approach to better characterize the effects of effluent variability. The approach combines knowledge of effluent variability as estimated by a coefficient of variation (CV) with the uncertainty due to a limited number of data to project an estimated maximum concentration for the effluent. Once the CV for each pollutant parameter has been calculated, the reasonable potential multiplier (RPM) used to derive the maximum projected effluent concentration (C_e) can be calculated using the following equations:

First, the percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - \text{confidence level})^{1/n} \qquad \text{Equation 7}$$

where,
p_n = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 99% = 0.99

and

$$RPM = \frac{C_{99}}{C_{P_n}} = \frac{e^{Z_{99} \times \sigma - 0.5 \times \sigma^2}}{e^{Z_{P_n} \times \sigma - 0.5 \times \sigma^2}} \qquad \text{Equation 8}$$

Where,
σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile)

Z_{Pn} = z-score for the P_n percentile (inverse of the normal cumulative distribution function at a given percentile)
CV = coefficient of variation (standard deviation ÷ mean)

The maximum projected effluent concentration is determined by simply multiplying the maximum reported effluent concentration by the RPM:

$$C_e = (RPM)(MRC) \quad \text{Equation 9}$$

where MRC = Maximum Reported Concentration

Reasonable Potential

The discharge has reasonable potential to cause or contribute to an exceedance of water quality criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the most stringent criterion for that pollutant.

Results of Reasonable Potential Calculations

It was determined that the KPSD's discharge of chlorine, ammonia, nitrate+nitrite and total phosphorus have reasonable potential to cause or contribute to an exceedance of water quality criteria at the edge of the mixing zone. The results of the calculations are presented in Table E-1 of this appendix.

B. WQBEL Calculations

The following calculations demonstrate how the water quality-based effluent limits (WQBELs) in the draft permit were calculated. The WQBELs for ammonia and chlorine are intended to protect aquatic life criteria. The following discussion presents the general equations used to calculate the water quality-based effluent limits. The calculations for all WQBELs based on aquatic life criteria are summarized in Table E-2.

Calculate the Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated using the same mass balance equations used to calculate the concentration of the pollutant at the edge of the mixing zone in the reasonable potential analysis (Equations 4 and 6). To calculate the wasteload allocations, C_d is set equal to the acute or chronic criterion and the equation is solved for C_e. The calculated C_e is the acute or chronic WLA. Equation 6 is rearranged to solve for the WLA, becoming:

$$C_e = WLA = D \times (C_d - C_u) + C_u \quad \text{Equation 10}$$

The next step is to compute the "long term average" concentrations which will be protective of the WLAs. This is done using the following equations from the EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a \times e^{(0.5\sigma^2 - z\sigma)} \quad \text{Equation 11}$$

$$LTA_c = WLA_c \times e^{(0.5\sigma_4^2 - z\sigma_4)} \quad \text{Equation 12}$$

where,

σ^2 = $\ln(CV^2 + 1)$
Z_{99} = 2.326 (z-score for the 99th percentile probability basis)
CV = coefficient of variation (standard deviation ÷ mean)

$$\sigma_4^2 = \ln(CV^2/4 + 1)$$

For ammonia, because the chronic criterion is based on a 30-day averaging period, the Chronic Long Term Average (LTAc) is calculated as follows:

$$LTA_c = WLA_c \times e^{(0.5\sigma_{30}^2 - z\sigma_{30})} \quad \text{Equation 13}$$

where,

$$\sigma_{30}^2 = \ln(CV^2/30 + 1)$$

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits as shown below.

Derive the maximum daily and average monthly effluent limits

Using the TSD equations, the MDL and AML effluent limits are calculated as follows:

$$MDL = LTA \times e^{(z_m\sigma - 0.5\sigma^2)} \quad \text{Equation 14}$$

$$AML = LTA \times e^{(z_a\sigma_n - 0.5\sigma_n^2)} \quad \text{Equation 15}$$

where σ, and σ² are defined as they are for the LTA equations above, and,

σ_n^2 = $\ln(CV^2/n + 1$

z_a = 1.645 (z-score for the 95th percentile probability basis)

z_m = 2.326 (z-score for the 99th percentile probability basis)

n = number of sampling events required per month. With the exception of ammonia, if the AML is based on the LTA_c, i.e., $LTA_{minimum} = LTA_c$), the value of ‘‘n’’ should is set at a minimum of 4. For ammonia, In the case of ammonia, if the AML is based on the LTA_c, i.e., $LTA_{minimum} = LTA_c$), the value of ‘‘n’’ should is set at a minimum of 30.

Table E-2, below, details the calculations for water quality-based effluent limits.

Table E-1: Reasonable Potential Calculations

Effluent Percentile value	99%																
				State Water Quality Standard		Max concentration at edge of...											
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Pn	Max effluent conc. measured (metals as total recoverable)	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
Ammonia June - September (mg/L)	1.00	1.00	0.0400	4.63	1.68	45.70	44.84	YES	0.957	35.00	0.55	0.52	105	1.37	1.05	1.07	
Ammonia October - May (mg/L)	1.00	1.00	0.0400	4.63	2.10	45.70	45.01	YES	0.957	35.00	0.55	0.52	105	1.37	1.05	1.06	
NO2 + NO3 (mg/L)	1.00	1.00	0.6000		10		17.01	YES	0.940	18.70	1.09	0.89	74	1.99		2.23	
Chlorine (µg/L)	1.00	1.00				18.12	17.85	YES	N/A	19.00	N/A	N/A	N/A	1.00	1.05	1.06	Previous MDL
TP (mg/L)	1.00	1.00	0.0310		0.009		3.814	YES	N/A	8.46	N/A	N/A	N/A	1.00		2.23	

Table E-2: Effluent Limit Calculations – Aquatic Life Criteria

Statistical variables for permit limit calculation																		
LTA Probability Basis	99%		Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.															
MDL Probability Basis	99%																	
AML Probability Basis	95%																	
			Permit Limit Calculation Summary									Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations						
PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Ambient Concentration *ug/L*	Water Quality Standard Acute *ug/L*	Water Quality Standard Chronic *ug/L*	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments	WLA Acute *ug/L*	WLA Chronic *ug/L*	LTA Acute *ug/L*	LTA Chronic *ug/L*	Limiting LTA *ug/L*	Coeff. Var. (CV) *decimal*	# of Samples per Month *n*
Ammonia June - September (mg/L)	1.05	1.07	1.00	1.00	0.0400	4.63	1.68	**1.67**	**4.14**		4.851	1.788	1.668	1.422	1.422	0.55	30.00
Ammonia October - May (mg/L)	1.05	1.06	1.00	1.00	0.0400	4.63	2.10	**2.51**	**4.85**		4.851	2.230	1.668	1.774	1.668	0.55	4.00
Chlorine	1.05	1.06	1.00	1.00		19.00	11.00	**9.6**	**19.2**		19.9	11.7	6.4	6.2	6.2	0.60	4.00

Table E-3: Effluent Limit Calculations: Nitrate + Nitrite and TP

Revised 3/00	Ambient Concentration	Water Quality Criteria	Max concentration at edge of chronic mixing zone.	LIMIT REQ'D?	Expected Number of Compliance Samples per Month	AVERAGE MONTHLY EFFLUENT LIMIT	MAXIMUM DAILY EFFLUENT LIMIT	Coeff Variation		Dilution Factor
Parameter								*CV*	S	
Nitrate + Nitrite (mg/L)	0.60	10.00	17.01	YES	4	21.5	56.2	1.09	0.9	2.23
TP (µg/L)	33.0	9.0	3814	YES	4	9.0	18	0.60	0.6	1.00

C. References

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control.* US Environmental Protection Agency, Office of Water, EPA/505/2-90-001.

Appendix F: Clean Water Act Section 401 Certification